

PCT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
 United States Patent and Trademark
 Office
 Box PCT
 Washington, D.C.20231
 ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 19 October 2000 (19.10.00)	
International application No. PCT/EP00/00977	Applicant's or agent's file reference PC-2008471
International filing date (day/month/year) 08 February 2000 (08.02.00)	Priority date (day/month/year) 18 February 1999 (18.02.99)
Applicant BELLMANN, Günter et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

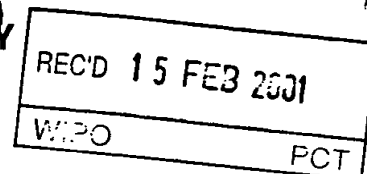
14 September 2000 (14.09.00)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Olivia TEFY Telephone No.: (41-22) 338.83.38
--	--

PCT



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference PC-2008471	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP00/00977	International filing date (day/month/year) 08/02/2000	Priority date (day/month/year) 18/02/1999
International Patent Classification (IPC) or national classification and IPC B05D1/26		
Applicant BTG ECLEPENS S.A.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 5 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 14/09/2000	Date of completion of this report 12.02.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Lorente Munoz, N Telephone No. +49 89 2399 2989 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP00/00977

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).):*

Description, pages:

1,3-6,8,9	as originally filed			
2,2a,7	as received on	01/12/2000	with letter of	28/11/2000

Claims, No.:

1-10	as received on	01/12/2000	with letter of	28/11/2000
------	----------------	------------	----------------	------------

Drawings, sheets:

1/1	as originally filed
-----	---------------------

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP00/00977

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-10
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-10
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-10
	No:	Claims	

2. Citations and explanations
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/00977

Reference is made to the following document:

D1: EP-A-0 369 181

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

- 1.) The application relates to processes for the manufacture of coating or doctoring blades comprising a band of steel or other form-stable material and a wear-resistant coating applied onto said band along a longitudinal edge section thereof subject to wear.
- 2.) The document D1 is regarded as the closest prior art to the subject-matter of claims 1 and 2.
- 3.) The subject-matter of claim 1 differs from the closest prior art D1 in that the applied composition is allowed to spread out so as to reach the very extreme of the edge section and then to cure to form an elastic and tacky-free coating.

The technical effect related to these features is to prevent the formation of air bubbles and sticking, and to obtain a homogeneous coating of the blade.

- 4.) The problem to be solved by the present invention may be regarded as how to provide a continuous process for the manufacturing of coating or doctoring blades without limitations to length and geometry of the coated blade.

The solution to this problem is disclosed in the characterising part of claim 1 of the application.

- 5.) The solution to this problem disclosed in claim 1 of the present application is neither known nor suggested by the available prior art and would not be obvious for the skilled person.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/00977

Therefore, the subject-matter of claim 1 meets the requirements of Art. 33(2)-(3) PCT.

- 6.) The subject-matter of claim 2 differs from the closest prior art D1 in that the coating is applied to a band of double width compared to the band of claim 1, allowing the applied composition to spread out to the desired width, curing the composition to form an elastic and tacky-free coating and longitudinally cutting this band.

The technical effect related to this feature is to prevent the formation of air bubbles and sticking, and to obtain a perfect coated edge of a blade.

- 7.) The problem to be solved by the present invention may be regarded as how to provide a continuous process for the manufacturing of coating or doctoring blades with perfect coated edges.

The solution to this problem is disclosed in the characterising part of claim 2 of the application.

- 8.) The solution to this problem disclosed in claim 2 of the present application is neither known nor suggested by the available prior art and would not be obvious for the skilled person.

Therefore, the subject-matter of claim 2 meets the requirements of Art. 33(2)-(3) PCT.

- 9.) Claims 3 to 10 are dependent on claims 1 and 2 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

terial, and the higher the pressure necessary to fill the mould;

- there are limitations in blade length because of difficulties in filling the mould without defects occurring, the need for longer pot-lives and lower viscosities, increasing mould weight, time to open, close and clean the mould etc.

→ see p. 2a

For these and other reasons it is desirable to develop a simple and economic continuous process to produce such blades without limitations to length and geometry.

Brief summary of the invention

One object of the invention is to provide a continuous process for the manufacture of coating or doctoring blades provided with a wear-resistant soft or rubbery coating.

Another object of the invention is to provide such a process which will impart no limitations to blade length and geometry of the coated blade.

Still another object of the invention is to provide a continuous process which is commercially competitive and flexible to meet consumers' specifications.

For these and other objects which will be clear from the following disclosure the invention provides a continuous process for the manufacture of coating or doctoring blades comprising a band of steel or other form-stable material and a wear-resistant polymer coating applied on said band along a longitudinal edge section thereof subjected to wear. The process involves the following steps:

- a) providing continuous relative movement between said band and an application and treatment station;
- b) continuously applying at said station a fast-curing polymer composition along said edge section;

2a

EP A2 0 369 181 is an example of somewhat related art, wherein the edge section of thin metal sheets, mainly for the purpose of protection against corrosion, is covered on both sides including the edge portion thereof with a sealing material. This two-sided coating of the edge is provided with its final profile by extrusion through a correspondingly configured nozzle. However, the document does not relate to coating or doctoring blades, nor is the protective profile obtained by a process bearing any relation to the present invention.

chine assembly for performing the continuous process in accordance with the invention. A steel band 1 is supplied from a storage reel 19 and travels through a hot air tunnel²¹ for pre-heating and drying purposes. A mixing chamber 5 23 provided with an application nozzle 25 is placed above the travelling band 1 and applies a coating composition along the edge of band 1 as illustrated in Figure 1. The coated band 1 further travels through a hot air tunnel 27 for curing purposes and band 1 with the applied elastic and tacky-free coating is then wound up on a take-up reel 10 29 using a spacer to avoid surface damage and also to compensate for the coating thickness. The coated blade is then ground to the desired shape and geometry and the band is cut in desired lengths to meet the consumers' 15 need.

Description of specific embodiments

The following examples further illustrate the invention by specific embodiments thereof. It should be noted, 20 however, that the invention is not restricted to these examples.

Example I

a) Bonding agent

25 A reel of cold rolled steel having a thickness of 0.635 mm, a width of 100 mm and a length of 30 m, is sand blasted on one side in an area forming a 3 cm wide longitudinal strip from one edge, using *Edelkorund weiss (WSK) F 180* (Treibacher). The roughened surface area is coated 30 in a continuous way with a bonding agent such as *Chemosil 597 E* (Henkel) used to promote adhesion of cast polyurethanes to steel. The bonding agent solution is applied without dilution by means of a 0.15 mm thick and 4 cm wide bent steel blade so as to cover the entire sand 35 blasted area with a regular and smooth film of approximately 15 μ m dry thickness. After evaporation of the solvent, the reel of coated steel is optionally cured in a

CLAIMS

1. A process for the manufacture of a coating or doctoring blade comprising a band (1) of steel or other form-stable material and a wear-resistant polymer coating
5 (5) applied on said band along a longitudinal edge section thereof subjected to wear, comprising the following steps:

a) providing continuous relative movement between said band (1) and an application and treatment station
10 (21,23,27); and

b) continuously applying at said station a fast-curing polymer composition along said edge section (5), characterized by

c) allowing the applied composition to spread out so
15 as to reach the very extreme of said edge section and then to cure to form an elastic and tacky-free coating; and, optionally

d) post-curing the coating at an increased temperature.

20 2. A process for the manufacture of a coating or doctoring blade comprising a first band (1) of steel or other form-stable material and a wear-resistant polymer coating (5) applied on said band along a longitudinal edge section thereof subjected to wear, characterized by
25 the following steps:

a) providing continuous relative movement between a second band (9) of double width compared to said first band and an application and treatment station
(21,23,27);

30 b) continuously supplying at said station a fast-curing composition along a longitudinal central section (13) of double width compared to said edge section (5);

c) allowing the applied composition to spread out to the desired width and then to cure to form an elastic and tacky-free coating and, optionally, post-curing the
35 coating at an increased temperature; and

d) longitudinally cutting said second band along the middle of the coated central section thereof to form two tip-coated blades.

3. A process according to claim 1 or 2,
5 characterized by roughening said edge (5) or central section (13) before application step b) to improve adhesion of the coating.

4. A process according to claim 1, 2 or 3,
10 characterized by the application of a primer before application step b) to further improve adhesion of the coating.

5. A process according to any preceding claim, wherein said fast-curing polymer composition has a pot-life of about 5 to 30 seconds.

15 6. A process according to any preceding claim, wherein said polymer composition is based on a polymer selected from polyurethanes, styrene-butadien polymers, polyolefins, nitrile rubbers, natural rubbers, polyacrylates, polychloroprene, thermoplastic elastomers,
20 and polysiloxanes.

7. A process according to claim 6, wherein said polymer is a polyurethane.

8. A process according to claim 7, wherein a 3-component liquid polyurethane composition containing a
25 prepolymer, a polyol and a chain extender is continuously mixed with a catalyst solution and the mixture is then applied onto said band.

9. A process according to any preceding claim, wherein said polymer is applied with a width of about 5
30 to 40 mm and a thickness of about 1 to 3 mm.

10. A process according to any preceding claim, wherein said polymeric coating after curing is subjected to a grinding operation to obtain a desired profile.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

INTERNATIONAL SEARCH REPORT

Inte Application No
PCT/EP 00/00977A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B05D1/26 B05C5/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B05D B05C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 369 181 A (LENHARDT MASCHINENBAU) 23 May 1990 (1990-05-23) the whole document	1

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

3 July 2000

Date of mailing of the international search report

11/07/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo.nl,
Fax: (+31-70) 340-3016

Authorized officer

Brothier, J-A

Information on patent family members

PCT/EP 00/00977

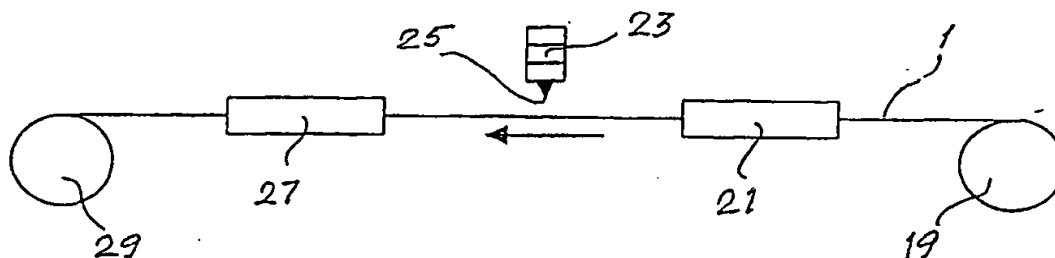
Form PCT/ISA/210 (patent family annex) (July 1992)



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : B05D 1/26, B05C 5/02		A1	(11) International Publication Number: WO 00/48746
			(43) International Publication Date: 24 August 2000 (24.08.00)
(21) International Application Number: PCT/EP00/00977 (22) International Filing Date: 8 February 2000 (08.02.00) (30) Priority Data: 9900564-7 18 February 1999 (18.02.99) SE (71) Applicant (for all designated States except US): BTG ECLEPENS S.A. [CH/CH]; z.l. Village, CH-1312 Eclepens (CH). (72) Inventors; and (75) Inventors/Applicants (for US only): BELLMANN, Günter [CH/CH]; 39, chemin de la Dauphine, CH-1291 Commugny (CH). FRETJ, Silvano [CH/CH]; 46, chemin de la Damaz, CH-1162 St. Prex (CH). GERBER, André [CH/CH]; 11a, chemin des Mélèzes, CH-1197 Prangins (CH). (74) Agent: AWAPATENT AB; Box 45086, S-104 30 Stockholm (SE).		(81) Designated States: AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), DM, EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.	

(54) Title: A PROCESS FOR THE MANUFACTURE OF SOFT TIPPED BLADES



(57) Abstract

A process for the manufacture of a coating or doctoring blade comprising a band of steel or other form-stable material and a wear-resistant polymer coating applied along a longitudinal edge section thereof subjected to wear, said process comprising the following steps: (a) providing continuous relative movement between said band and an application and treatment station; (b) continuously applying at said station a fast-curing polymer composition along said edge section; (c) allowing the applied composition to spread out so as to reach the very extreme of said edge section and then to cure to form an elastic and tacky-free coating; and, optionally (d) post-curing the coating at an increased temperature; as an alternative to such process there can be used a blade of double width compared to said first band and continuously supplying a fast-curing composition along a longitudinal central section of double width compared to said edge section and longitudinally cutting said second band along the middle of the coated central section thereof to form two tip-coated blades; and a coating or doctoring blade prepared by such process.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakhstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

A PROCESS FOR THE MANUFACTURE OF SOFT TIPPED BLADES.Technical field

The present invention relates to processes for the manufacture of coating or doctoring blades comprising a band of steel or other form-stable material and a wear-resistant coating applied onto said band along a longitudinal edge section thereof subject to wear.

Background of the invention

Coating or doctoring blades tipped with rubbery or soft material are presently prepared only by moulding in a closed mould in which a band of steel or other form-stable material is placed and constitutes substrate for the coating. A liquid mix of components is injected at the lower end of a preheated mould until it appears at the opposite upper end. Care has to be taken to prevent introduction of air bubbles in the liquid material and no leakage from the mould must occur. A demoulding agent, generally based on silicones, is applied on the mould surfaces to prevent sticking of the cured material. Once filled, the mould is introduced into a circulated air oven at 80-110°C until curing has taken place so that the blades can be demoulded. This takes generally 45 to 180 minutes. After demoulding the blades are post-cured at 80-110°C for 12-24 hours.

This batch process is associated with several disadvantages, among which the main drawbacks are:

- the process encounters low productivity;
- each new blade geometry and blade length requires a new mould;
- the mould manufacturing costs are high, especially for large moulds with complex profiles;
- the larger the mould, the larger the oven necessary to preheat the mould and to cure the rubbery or soft ma-

terial, and the higher the pressure necessary to fill the mould;

- there are limitations in blade length because of difficulties in filling the mould without defects occurring, the need for longer pot-lives and lower viscosities, increasing mould weight, time to open, close and clean the mould etc.

For these and other reasons it is desirable to develop a simple and economic continuous process to produce such blades without limitations to length and geometry.

Brief summary of the invention

One object of the invention is to provide a continuous process for the manufacture of coating or doctoring blades provided with a wear-resistant soft or rubbery coating.

Another object of the invention is to provide such a process which will impart no limitations to blade length and geometry of the coated blade.

Still another object of the invention is to provide a continuous process which is commercially competitive and flexible to meet consumers' specifications.

For these and other objects which will be clear from the following disclosure the invention provides a continuous process for the manufacture of coating or doctoring blades comprising a band of steel or other form-stable material and a wear-resistant polymer coating applied on said band along a longitudinal edge section thereof subjected to wear. The process involves the following steps:

- a) providing continuous relative movement between said band and an application and treatment station;
- b) continuously applying at said station a fast-curing polymer composition along said edge section;

c) allowing the applied composition to spread out so as to reach the very extreme of said edge section and then to cure to form an elastic and tacky-free coating; and, optionally

5 d) post-curing the coating at an increased temperature.

According to an alternative embodiment of such continuous process the following steps are involved:

a) providing continuous relative movement between a
10 second band of double width compared to said first band and an application and treatment station;

b) continuously supplying at said station a fast-curing composition along a longitudinal central section of double width compared to said edge section;

15 c) allowing the applied composition to spread out to the desired width and then to cure to form an elastic and tacky-free coating and, optionally, post-curing the coating at an increased temperature; and

d) longitudinally cutting said second band along the
20 middle of the coated central section thereof to form two tip-coated blades.

In the process according to the invention it is preferred to introduce before application step b) above a
25 roughening step for said edge or central section to improve the adhesion of the coating.

It is also preferred for further improving the adhesion of the coating to apply a primer before application step b) above.

30 According to a preferred embodiment of the invention the fast-curing polymer composition has a pot-life of about 5 to about 30 sec.

Among preferred fast-curing polymers there may be mentioned those selected from polyurethanes, styrene-butadien polymers, polyolefins, nitrile rubbers, natural
35 rubbers, polyacrylates, polychloroprene, thermoplastic elastomers, and polysiloxanes. It is particularly pre-

ferred to use as a polymer a polyurethane.

A suitable fast-curing polymer composition is a 3-component liquid polyurethane composition containing a prepolymer, a polyol and a chain extender. Such composition is continuously mixed with a catalyst solution, whereafter the mixture is applied onto the band to be coated.

The coating width is preferably from about 5 to about 40 mm and a preferred thickness is from about 1 to about 3 mm.

After curing of the coating it is preferred to subject the coating to a grinding operation to obtain the desired profile or geometry.

15 Brief summary of the drawing

The present invention will in the following be described with reference to the appended drawing, wherein:

Figure 1 is a diagrammatic view of a continuously moving band also illustrating the coating to be applied;

20 Figure 2 is a corresponding view of the alternative procedure of simultaneous manufacture of two soft-tipped blades; and

Figure 3 is a diagrammatic side view of an assembly for performing the continuous process according to the invention.

Detailed description of the invention

A preferred sequence of process steps is described in the following in general terms, but it should be observed that the present invention is not restricted to such steps other than as defined in the accompanying claims.

35 Step 1. This step involves surface preparation of a cold rolled metallic substrate having a thickness of 0.1 to 1.5 mm, a width of 50 to 200 mm and a length of up to 100 m. The surface area of the blade intended to receive the soft material deposit (edge or centre) is roughened

by sand or grit-blasting and optionally thereafter degreased and cleaned. The width of the roughened surface area is between 5 and 40 mm (double these figures for centre deposit).

5 Step 2. This step is concerned with the deposition of adherend or primer. In order to achieve a good adhesion between the soft material composition and the base substrate application of an intermediate bonding layer is preferred. The solvent or water-borne adherend or primer
10 solution is applied on top of the sand or grit-blasted surface area by anyone of the following methods: spraying, brushing, roller coating, doctor blade application, flow coating, etc in such a way as to produce an even and smooth coating of a dry thickness of 5 to 30 μm . In order
15 to assist and accelerate solvent or water evaporation the blade can be passed through a hot air drying tunnel after which the coating becomes tack-free enabling winding up of the coated blade.

Step 3. The soft material composition is applied on
20 top of the primer intermediate layer using a low (or high) pressure mixing and dosing machine capable of handling ultra-fast curing multicomponent resin systems with pot-lives as short as 5-30 seconds. The mixed resin components are poured directly from the mixing chamber onto
25 the moving metallic substrate through a suitable nozzle.

 During the 5-30 seconds of pot-life, the resin spreads out until it reaches the edge of the substrate or remains in the centre of the blade of double width depending on the positioning of the nozzle. After this very
30 short time, viscosity increases due to the reaction of the components and prevents further spreading out or dripping off the substrate edge in the alternative of edge coating of a single width blade. By the time the applied resin reaches the winding up site it has hardened
35 or cured to the extent of becoming elastic and tacky-free and the blade can be wound up using a spacer to avoid surface damage. The width and thickness of the applied

ribbon is controlled by the flow rate and the linear velocity of the substrate, but depends also on the initial rheology and pot-life corresponding to the rate of viscosity increase of the formulation. The pot-life is controlled by the type and concentration of the curing catalyst.

Typically a width of 5-40 mm is achieved and a thickness of 1-3 mm, when using a flow rate of 0.25 to 1.5 kg/min and a linear speed of 1.5 to 10 m/min of the travelling band.

Step 4. In order to obtain optimal mechanical properties of the rubber-like composition thermal treatment is performed to further post-cure the material. This can be directly performed on the wound up blade of Step 3 by introducing same into a circulated air oven for 16-24 h at 80-85°C.

Step 5. Finally, the post-cured rubber-like deposit is ground to the desired shape and geometry, and the blades are cut to the desired dimensions. In the alternative case of a deposit on the substrate centre the blade is first longitudinally cut in two halves by means of a laser beam or any other cutting device.

The drawing illustrates diagrammatically the two alternatives of blade manufacture in Figures 1 and 2 and also a suitable machine set up for the continuous process in accordance with Figure 3.

In Figure 1 there is shown a travelling steel band 1 moving in the direction of arrow a). The resin nozzle 3 applies the resin composition which widens to the desired ribbon 5 reaching up to one edge of blade 1.

Figure 2 shows the alternative of a simultaneous manufacture of two blades by using a blade 9 of double width and the application of a coating 13 of double width from an application nozzle 11. After curing of coating 13 the blade is longitudinally cut into two halves along line 15 by means of laser or any suitable cutting device.

Figure 3 shows diagrammatically a side view of a ma-

chine assembly for performing the continuous process in accordance with the invention. A steel band 1 is supplied from a storage reel 19 and travels through a hot air tunnel for pre-heating and drying purposes. A mixing chamber 5 23 provided with an application nozzle 25 is placed above the travelling band 1 and applies a coating composition along the edge of band 1 as illustrated in Figure 1. The coated band 1 further travels through a hot air tunnel for curing purposes and band 1 with the applied elastic and tacky-free coating is then wound up on a take-up reel 10 29 using a spacer to avoid surface damage and also to compensate for the coating thickness. The coated blade is then ground to the desired shape and geometry and the band is cut in desired lengths to meet the consumers' 15 need.

Description of specific embodiments

The following examples further illustrate the invention by specific embodiments thereof. It should be noted, 20 however, that the invention is not restricted to these examples.

Example I

a) Bonding agent

25 A reel of cold rolled steel having a thickness of 0.635 mm, a width of 100 mm and a length of 30 m, is sand blasted on one side in an area forming a 3 cm wide longitudinal strip from one edge, using *Edelkorund weiss (WSK) F 180* (Treibacher). The roughened surface area is coated 30 in a continuous way with a bonding agent such as *Chemosil 597 E* (Henkel) used to promote adhesion of cast polyurethanes to steel. The bonding agent solution is applied without dilution by means of a 0.15 mm thick and 4 cm wide bent steel blade so as to cover the entire sand 35 blasted area with a regular and smooth film of approximately 15 μ m dry thickness. After evaporation of the solvent, the reel of coated steel is optionally cured in a

circulated air oven at 85°C for 2 hours.

b) PUR top coat

The liquid cast polyurethane composition used to coat the blade is applied on top of the bonding agent coated strip by means of a low pressure mixing and dosing machine equipped with a device allowing to inject a catalyst directly into the mixing chamber. The 3 component PUR is formulated to an ultra fast-curing composition by injecting a highly efficient catalyst solution directly into the mixing chamber. The composition is made up of an MDI (Polyester "quasi" prepolymer having an isocyanate content of 16.4% such as Ureflex[®] MDQ 23165 (Baulé), a Polyester Polyol Ureflex[®] D20 (Baulé) and a chain extender 1,4-Butanediol (Baulé), mixed in a ratio of 100:140:10.4 respectively. The catalyst solution Ureflex[®] SD6 (Baulé) is introduced directly into the mixing chamber at a rate of 2% of the total output of 0.25 kg/min, providing a pot-life of approximately 15 sec and a gel time of approximately 30 sec. The liquid mix is applied at 1 cm of the edge within the 3 cm wide bonding agent strip on the substrate moving at a linear speed of 3.3 m/min. The moving substrate is wound up 4 m away from the pouring point, leaving enough time for the polyurethane to gelify and become tack-free, while using a spacer so as to prevent any surface damage of the applied Polyurethane elastomer during the winding up operation. The reel of wound up substrate and spacer is then submitted to a heat treatment in a circulated air oven at 85°C for 24 h. After cooling down, the reel is unwound and shows no deformation of the metal substrate. The fully cured polyurethane elastomer strip has a shore A hardness of 70-73 (measured on the blade), a width of 3 cm and a thickness of 2.5 mm, obtained in one pass. Finally, the blades are ground in a continuous way to the final blade geometry and cut to the desired length.

Example II

Example I is repeated using a steel band with a width of 200 mm, the area to be coated being centrally positioned and having a width of 6 cm. This area is
5 treated and coated as described in Example I and the band is then laser cut along the middle of the coated area, and tip grinding is performed to the desired blade geometry.

The invention has been described above by specific
10 examples and sequence of steps involved in the continuous process according to the invention. However, it is clear to the skilled artisan that the process can be modified in different ways without departing from the inventive concept according to the appended claims. All such modi-
15 fications are intended to be covered by said claims.

CLAIMS

1. A process for the manufacture of a coating or doctoring blade comprising a band of steel or other form-stable material and a wear-resistant polymer coating applied on said band along a longitudinal edge section thereof subjected to wear, characterized by the following steps:

- a) providing continuous relative movement between said band and an application and treatment station;
- 10 b) continuously applying at said station a fast-curing polymer composition along said edge section;
- c) allowing the applied composition to spread out so as to reach the very extreme of said edge section and then to cure to form an elastic and tacky-free coating;
- 15 and, optionally
- d) post-curing the coating at an increased temperature.

2. A process for the manufacture of a coating or doctoring blade comprising a first band of steel or other form-stable material and a wear-resistant polymer coating applied on said band along a longitudinal edge section thereof subjected to wear, characterized by the following steps:

- a) providing continuous relative movement between a second band of double width compared to said first band and an application and treatment station;
- 25 b) continuously supplying at said station a fast-curing composition along a longitudinal central section of double width compared to said edge section;
- 30 c) allowing the applied composition to spread out to the desired width and then to cure to form an elastic and tacky-free coating and, optionally, post-curing the coating at an increased temperature; and
- d) longitudinally cutting said second band along the middle of the coated central section thereof to form two
- 35 tip-coated blades.

3. A process according to claim 1 or 2, characterized by roughening said edge or central section before application step b) to improve adhesion of the coating.

4. A process according to claim 1, 2 or 3, characterized by the application of a primer before application step b) to further improve adhesion of the coating.

5. A process according to any preceding claim, wherein said fast-curing polymer composition has a pot-life of about 5 to 30 seconds.

6. A process according to any preceding claim, wherein said polymer composition is based on a polymer selected from polyurethanes, styrene-butadien polymers, polyolefins, nitrile rubbers, natural rubbers, polyacrylates, polychloroprene, thermoplastic elastomers, and polysiloxanes.

7. A process according to claim 6, wherein said polymer is a polyurethane.

8. A process according to claim 7, wherein a 3-component liquid polyurethane composition containing a prepolymer, a polyol and a chain extender is continuously mixed with a catalyst solution and the mixture is then applied onto said band.

9. A process according to any preceding claim, wherein said polymer is applied with a width of about 5 to 40 mms and a thickness of about 1 to 3 mms.

10. A process according to any preceding claim, wherein said polymeric coating after curing is subjected to a grinding operation to obtain a desired profile.

11. A coating or doctoring blade prepared by the process according to any one of the preceding claims.

1/1

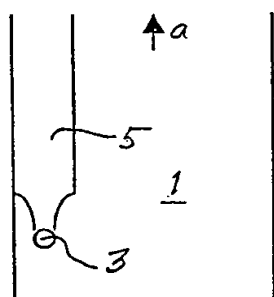


Fig.1

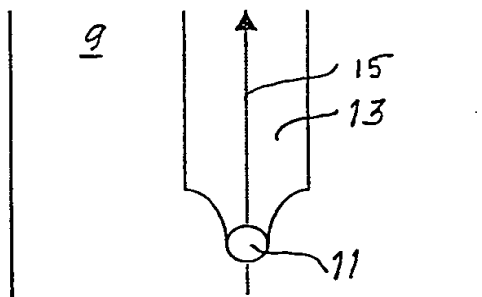


Fig.2

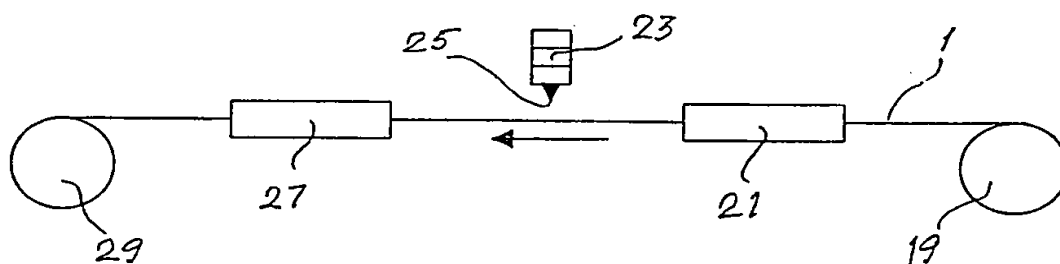


Fig.3

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 00/00977

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B05D1/26 B05C5/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B05D B05C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 369 181 A (LENHARDT MASCHINENBAU) 23 May 1990 (1990-05-23) the whole document -----	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

3 July 2000

Date of mailing of the international search report

11/07/2000

Name and mailing address of the ISA
European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Brothier, J-A

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference PC-2008471	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/EP 00/ 00977	International filing date (day/month/year) 08/02/2000	(Earliest) Priority Date (day/month/year) 18/02/1999
Applicant: BTG ECLEPENS S.A.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

3

☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/EP 00/00977

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B05D1/26 B05C5/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B05D B05C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 369 181 A (LENHARDT MASCHINENBAU) 23 May 1990 (1990-05-23) the whole document -----	1

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

3 July 2000

Date of mailing of the international search report

11/07/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Brothier, J-A

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 00/00977

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0369181	A	23-05-1990	DE 3835727 C	10-05-1990